

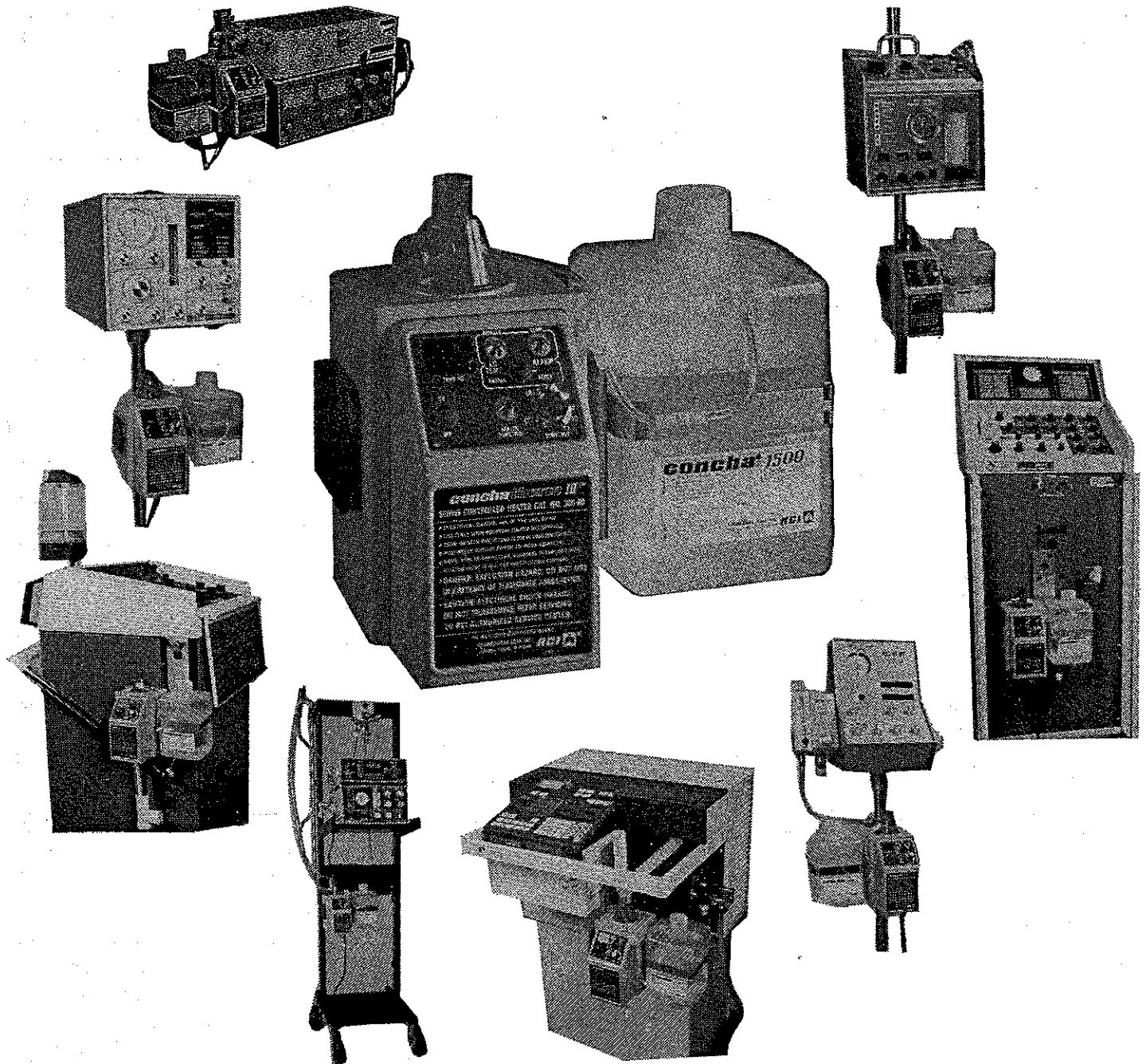
# concha<sup>®</sup>therm<sup>®</sup> III

**RCI** 

# HEATED MOLECULAR HUMIDIFIER WITH SERVO CONTROL, DIGITAL READOUT AND HIGH/LOW TEMPERATURE ALARMS

## INSTALLATION AND INSTRUCTIONS FOR USE

**PATENT NOS. 4,195,044; 4,322,594; other PATENTS PENDING**



## THE SYSTEM FOR ALL MODES OF GAS DELIVERY

# INTRODUCTION

# CONTENTS

The Conchapak® System III is complete, self contained and easily installed, for use in heating and humidifying gases transmitted by any mode to the patient. Its evaporative process offers virtually no resistance to gas flow. It provides continuous, heated molecular, high humidity at normal adult ventilator settings, for up to 24 hours, without changing the reservoir. At normal pediatric/neonatal ventilator settings, it will operate accurately and dependably for up to 72 hours, from a single sterile water reservoir bottle. Its gravity fed system permits uninterrupted sterile water flow and visible check of water supply.

The Conchapak can be used with continuous flow and oxygen diluter systems to provide 100% humidification of gases. Heated nebulization therapy can be achieved with the use of the Conchapak's adjustable nebulizer adapter. By utilizing an oxygen blender, it may be used in conjunction with oxyhoods. The system can also provide heated humidity for anesthesia, to help maintain the patient's body temperature.

With proper installation, operation and maintenance, as outlined in this manual, you will find your Conchapak System III unsurpassed in providing heated molecular high humidity.

## SPECIFICATIONS

**Catalog No.:** 380-80

**Approximate Net Weight:** 6 lbs.

**Power Requirements:** 115 VAC, 60 Hz, 185 Watts max

**Leakage Current:** Less than 100 micro amps; typically between 15-25 micro amps

**Dielectric Withstand Voltage:** 1250 V minimum for 1 minute

**High Temperature Alarm Limit:** Between 39.6 and 40.6°C, typically 40°C

**Low Temperature Alarm Limit:** Between 26 and 28°C; typically 27°C (Approximately 23 minutes after power is applied)

**Approved by Electrical Testing Laboratory,  
City of Los Angeles, California (1983-84)**

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## Section 1

# DESCRIPTION AND OPERATION

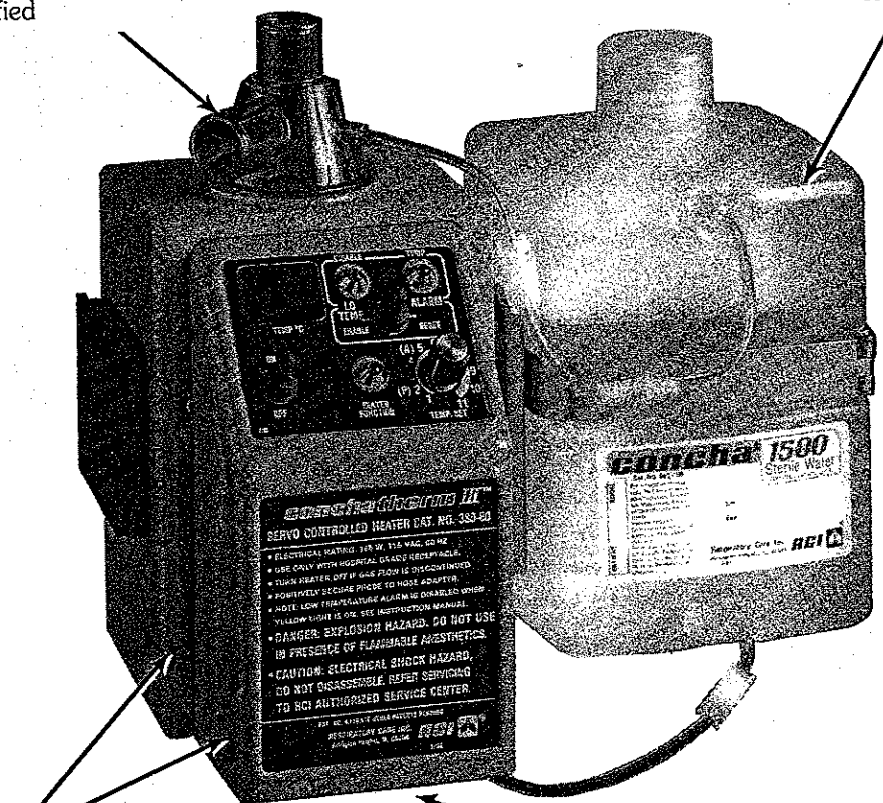
**conchapak®**

### 1-1. COMPONENTS

The Conchapak System III (figure 1) consists of:

Disposable Concha-Column® (two different types are available) through which the gas passes as it is heated and humidified

Concha® 1500 Sterile Water Reservoir



Conchatherm® III  
Servo Controlled  
Heater and Control  
Unit

Temperature probe (two different styles  
are available) to monitor output and to  
supply the alarm signals to the electronic  
control module of the Conchatherm III.

In addition, there are various adapters and mounting brackets available for expanding the versatility of your Conchapak System III.

**Figure 1-1**  
Conchapak System III Components

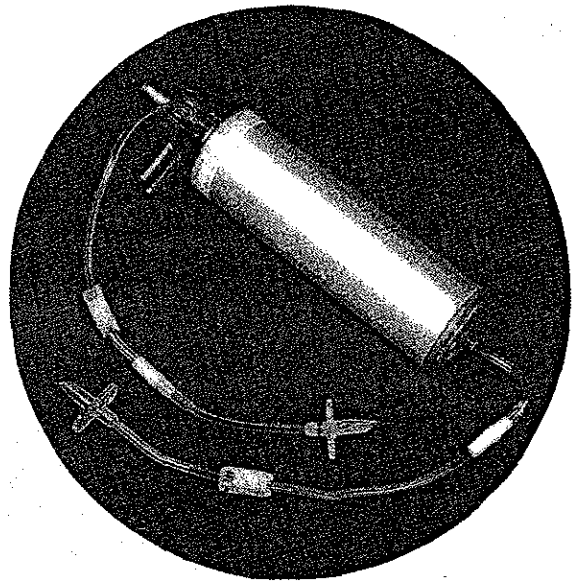
## Section 1

# DESCRIPTION AND OPERATION

### 1-2. CONCHA-COLUMNS

The heart of the Conchapak® non-invasive system is the Concha-Column® (figure 1-2). Heat passes, by conduction, through its sides (from the Conchatherm® III heater module). Water from the Concha® 1500 reservoir is absorbed by the special paper cylinder, which lines the column, is evaporated by this heat, and provides heated molecular, high humidity to the gases flowing from the ventilator or other gas source. There is virtually no resistance to gas flow and 100% humidity is provided. The temperature of the inspired gases is monitored and controlled as described in paragraphs 1-3 and 1-4, following.

Two types of columns are available — the Standard Adult Concha-Column and the Low Compliance Concha Pediatric/Adult Column. The Low Compliance Column labeling, located at neck of column, differs from labeling of the Standard Adult-column for ease of identification.



**Figure 1-2**

Typical Concha-Column with Tubing and Reservoir Puncture Pins

#### Standard Adult Column

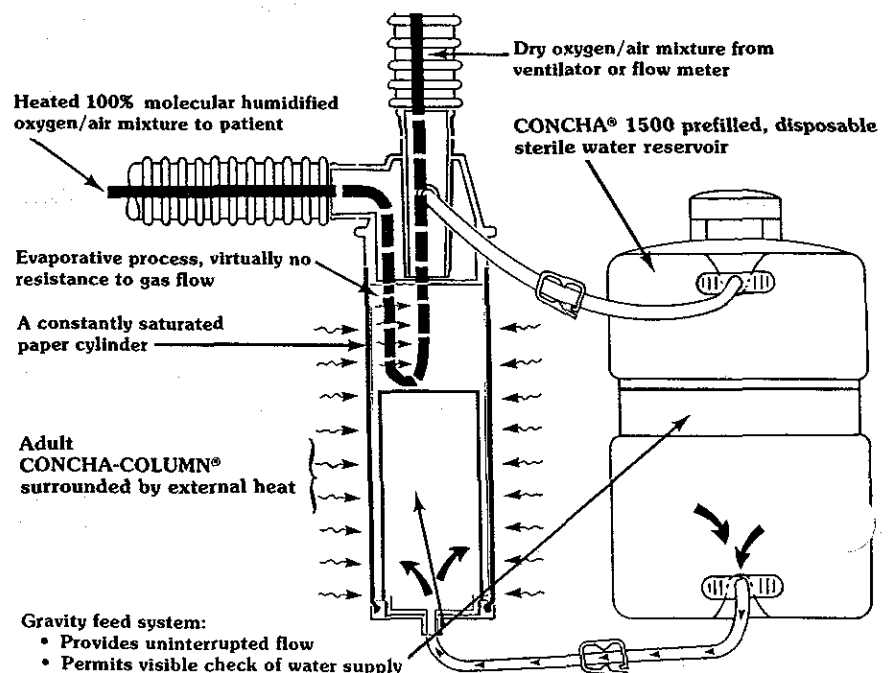
- black lettering on white background
- product name- CONCHA COLUMN

#### Low Compliance Pediatric/Adult Column

- red lettering on white background
- product name- PEDIATRIC COLUMN

### A. STANDARD ADULT CONCHA-COLUMN

In the Standard Adult Concha-Column (figure 1-3) water level in the column will always be the same as that in the reservoir (visible through the transparent plastic container). The breather tube provides pressure equalization, and no check valves are required in the tubes.



**Figure 1-3**

## Section 1

# DESCRIPTION AND OPERATION

### B. LOW COMPLIANCE CONCHA® PEDIATRIC/ADULT COLUMN

The Low Compliance Concha Pediatric Column was developed primarily for applications which require a more constant compressible volume and compliance, as with neonatal and pediatric ventilators. The Low Compliance Column can, however, also be used in most applications normally satisfied by the Standard Adult Concha-Column®.

The construction of the Low Compliance Column differs from the Standard Concha-Column in the following ways:

- A leveling/sensing tube has been added to the inside of the column.

This tube controls the water level in the column by controlling the amount of air allowed into the reservoir bottle head space. If the column water level is above the control level, the reservoir bottle air supply is cut off. If the column water level is below the control level, air can enter the bottle.

- A check valve has been added to the upper vinyl breather tube.

This valve allows flow into the reservoir bottle and prevents flow out of the reservoir bottle. This prevents the reservoir bottle pressure from being vented back into the column during the expiratory phase of a ventilator cycle.

- A check valve has been added to the lower vinyl feeder tube.

This prevents the flow of water from the column back into the reservoir bottle during the inspiratory phase of a ventilator cycle.

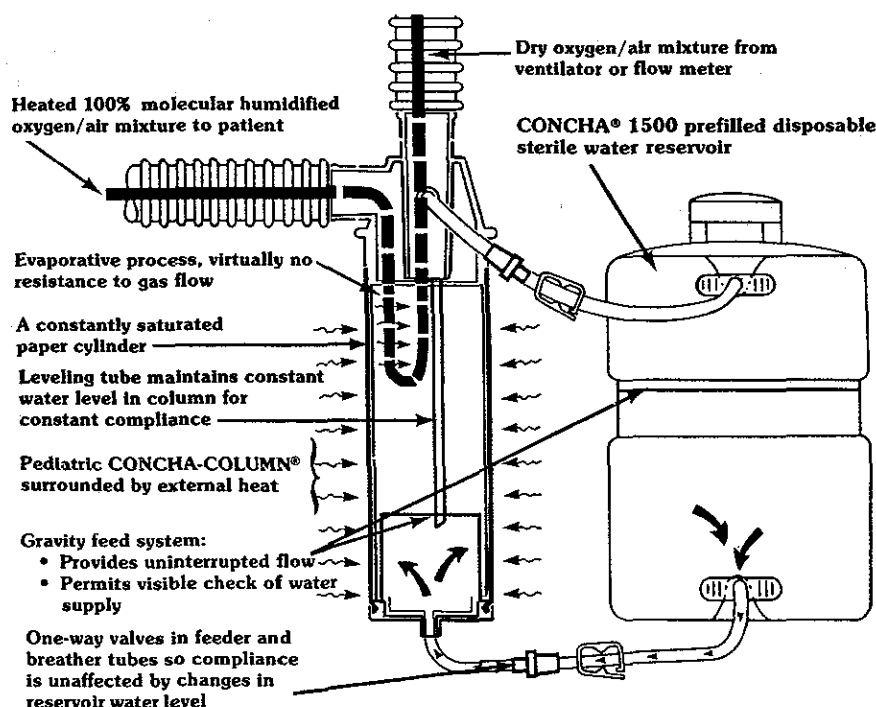


Figure 1-4

## Section 1

# DESCRIPTION AND OPERATION

### 1. COMPLIANCE

The compliance of the system is equivalent to the compliance of the column plus the amount of fluid transferred to the bottle during each inspiratory phase. The compliance of the column alone is approximately .25cc/cm H<sub>2</sub>O. The amount of fluid transferred to the bottle will vary slightly depending on the set-up. A typical set-up (20cm H<sub>2</sub>O P.A.P., 35 BPM, I/E=1:2 and 10 LPM) would produce a fluid transfer of about .03 cc/cm H<sub>2</sub>O (full bottle) to .09 cc/cm H<sub>2</sub>O (empty bottle). Under these conditions the system compliance would range from .28 to .34 cc/cm H<sub>2</sub>O.

A worse case set-up (60 cm H<sub>2</sub>O P.A.P., 10 BPM, I/E=1:1.4 and 30 LPM) would yield a system compliance of .34 to .40 cc/cm H<sub>2</sub>O (full to empty).

#### NOTE

Some fluid will always be transferred during each cycle. The fluid transferred to the bottle through the upper air tube can be in the form of air or water depending on the ventilator settings.

The following factors increase the amount of fluid transfer: higher peak pressures, lower breath rates, reduced water volume in bottle, I/E ratios approaching 1:1.4 and more square pressure wave forms.

### 2. TEMPERATURE

When compared to the Adult Concha-Column, the Concha-Pediatric Column will:

- Produce a higher output temperature 3-4°F (approx. 2°C)
- Heat up and cool down in considerably less time
- Produce a more constant temperature throughout the use of the reservoir bottle.

#### CAUTION

THE OUTPUT TEMPERATURE MUST BE MEASURED BEFORE CONNECTING CIRCUIT TO PATIENT AIRWAY.

### 3. COMPRESSIBLE VOLUME

The nominal compressible volume is 248 ± 12cc (the ± 12cc is the potential unit-to-unit variation created by manufacturing tolerances).

During operation, the compressible volume will have a variation from nominal of about ± 5cc. The water level will gradually drop as the gas is humidified. When the level drops to the refill point, water will automatically be added from the reservoir bottle. The time required for a complete cycle is dependent on the rate of water usage. Typically the level will take about 15 min. to drop and 2 min. to refill.

#### NOTE

Some conditions which will cause water in the column to temporarily rise above its normal level thus reducing the compressible volume, are:

- Starting the ventilator before the column is filled.
- Decreasing system pressure (reducing peak airway setting, turning off ventilator, disconnecting column from circuit, etc.).
- Tilting the column during operation.

The amount of water that rises above the normal level is dependent on several factors. A worst case condition would result in a compressible volume reduction of about 100cc. None of the above conditions can cause overfilling to the point of flooding the patient circuit. In each case, the operation will return to normal when excess water is evaporated or the original ventilator settings are reestablished.

## Section 1

# DESCRIPTION AND OPERATION

### 1-3. CONCHATHERM® III

Conchatherm III is a combined heater module and electronic control module. Mounting brackets on three sides of the unit are provided to aid in the most convenient positioning of the control panel and reservoir bottle bracket.

The control module provides continuous patient airway monitoring of the temperature selected by the therapist. It contains the electronic circuits which regulate the heat supplied by the heater module to the Concha-Column® as well as those circuits which control the various alarm systems. On its inclined panel are mounted the switches, regulating knob and indicators by which the Conchapak® System III is controlled and operated. See figure 1-5. A receptacle is provided on the bottom of the control module for connecting the temperature probe.

The heater module contains the heating elements that surround the properly installed Concha-Column through which heat is conducted to the sterile water for humidification of the ventilating gases.

#### A. CONTROLS AND INDICATORS (See figure 1-5)

##### 1. ON-OFF Power Switch

The ON-OFF switch activates all systems and should not be moved to the ON position without first starting gas flow.

##### NOTE

When gas flow is discontinued, move power switch to the OFF position.

##### 2. TEMP°C Digital Temperature Readout

This two-digit display continuously indicates the output temperature of the proximal airway with an accuracy of  $\pm 2^\circ\text{C}$ .

##### 3. LO TEMP DISABLE Alarm Indicator Light (yellow)

This low temperature indicator light will be on for a preset warm-up period of 20 to 30 minutes when the power switch is first moved to the ON position.

During this initial warm-up period the low temperature alarm is automatically disabled, allowing the heater to reach operating temperature.

After the warm up period has elapsed, the yellow LO TEMP DISABLE light will go out and the low temperature alarm system will be automatically activated. However, if the output temperature has already surpassed the minimum limit of  $26^\circ\text{C}$  to  $28^\circ\text{C}$  (as observed in the TEMP°C digital readout) before the preset warm-up period is over and the LO TEMP DISABLE light has not gone out, the low temperature alarm may instantly be enabled by the operator by moving the toggle switch (4, Fig. 1-5) to the LO TEMP ENABLE position.

This momentary toggle switch will return to its center position after being released.

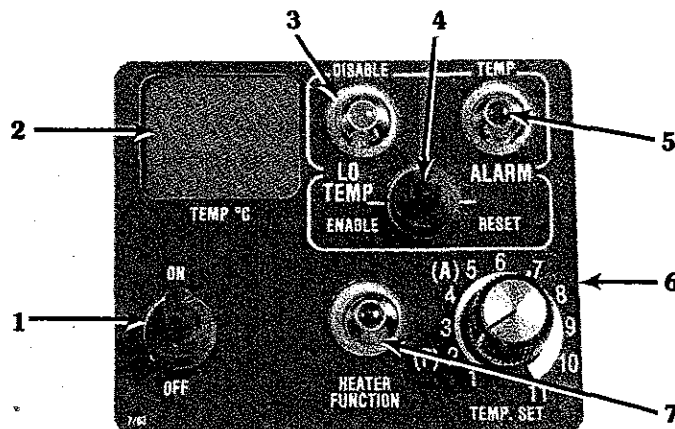


Figure 1-5

Conchatherm III Controls and Indicators

##### 4. LO TEMP ENABLE/RESET

Momentary Toggle Switch

If airway temperature of  $26^\circ\text{C}$  has not been reached within the warm-up period, the low temperature alarm will be activated. The LO TEMP ENABLE/RESET switch must be moved to the RESET position to silence the alarm and to start another preset warm-up time period.

##### NOTE

Moving the LO TEMP ENABLE/RESET switch to RESET position will not correct a low airway temperature condition, but will only silence the alarm and activate another heater warm-up period.

##### 5. TEMP Alarm Indicator Light (Red)

The TEMP alarm light will be activated in all alarm conditions. The Conchatherm III has four alarm conditions which will activate this light. (See alarm indications on the next page).

##### 6. TEMP. SET Knob

Temperature adjustment is made using the TEMP SET knob, in conjunction with the digital TEMP°C readout (2, Fig. 1-5). Because it is adjustable, desired temperature can be obtained despite configuration variables of flowrate, volume, breath rate and tubing.

**IMPORTANT:** See Operating Instructions, Section 2 for correct operating techniques.

##### 7. HEATER FUNCTION Indicator Light (Green)

When the heater of the Conchatherm III is ON, the green HEATER FUNCTION light is ON. The intensity of this light varies directly with the amount of power being applied to the heater.

##### NOTE

All alarm conditions cause the HEATER FUNCTION light to be OFF.

## Section 1

# DESCRIPTION AND OPERATION

### B. ALARM INDICATIONS (See figure 1-5)

Alarm will be ON in all of the alarm conditions described in paragraphs 1, 2, 3, 4 and 5 below.

#### 1. HEATER TEMPERATURE SENSOR Alarm

This alarm will occur if the heater temperature sensor, located within the Conchatherm® III unit, has become "open-circuited", a condition which causes loss of warm-up control, and the possibility of temperature output over-shoot. Since warm-up control is crucial to proper operation, (this alarm condition prohibits heating) it cannot be reset by the operator, and the Conchatherm III unit must be removed from use until it is repaired.

#### NOTE

If the Conchatherm III unit has been stored in an area with temperatures of 10°C (50°F) or cooler, it must be allowed to warm up to normal room temperature before moving the power switch (1, Fig. 1-5) to ON. If this is not done, the red TEMP indicator light will come ON and the audible alarm will sound.

#### 2. HIGH TEMPERATURE Alarm

This alarm will occur at a temperature output between 39 and 40 degrees centigrade. This alarm condition causes the heater to shut OFF. After the output temperature has decreased below the trip point, the alarm must be manually reset by moving the LO TEMP ENABLE/RESET switch to the RESET position. The TEMP°C display (2, Fig. 1-5) will, in most instances, be indicating 40 degrees centigrade in a high temperature alarm condition and the audible alarm will sound.

#### 3. LOW TEMPERATURE Alarm

This alarm will occur if the output temperature has failed to reach a minimum temperature of 26 to 28 degrees centigrade within an elapsed time of 20 to 30 minutes, or if the temperature drops below this range during operation. The audible alarm is disabled during the warm-up period and the yellow LO TEMP DISABLE light (3, Fig. 1-5) is ON until the minimum limit of 26°C to 28°C is reached. If the minimum temperature is not reached when the warm-up cycle is over, the audible alarm will sound. The operator can silence the alarm and initiate another warm-up cycle by moving the toggle switch (4, Fig. 1-5) momentarily to the RESET position. If the minimum temperature range is reached before the warm-up cycle is over, the operator may activate the low temperature alarm system manually by moving the toggle switch (4, Fig. 1-5) momentarily to the LO TEMP ENABLE position.

If the proximal airway probe becomes dislodged and the probe senses temperature below 28°C, the low temperature alarm will be activated and heating will cease.

To clear a low temperature alarm, move the momentary toggle switch (4, Fig. 1-5) to the RESET position. The air temperature probe should also be check-

ed for proper positioning in the proximal airway. The TEMP°C display (2, Fig. 1-5) will be indicating 28 degrees centigrade or lower in a low temperature alarm condition.

#### 4. TEMPERATURE PROBE DISCONNECT Alarm

This alarm will occur if the temperature probe becomes disconnected from the Conchatherm III, if the temperature probe is not plugged in properly, or if a wire in the temperature probe cable becomes broken and "open-circuited". This type of alarm can be distinguished from other alarm conditions by noting that the TEMP°C display indicates a 0 to 03 reading. The alarm RESET switch (4, Fig. 1-5) has no effect on clearing this alarm and heating will be inhibited.

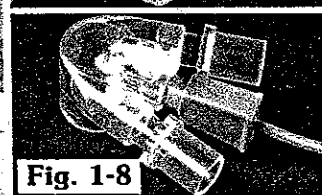
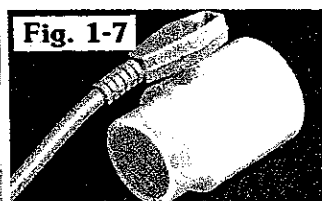
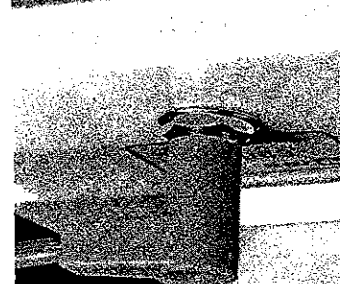
#### 5. TEMPERATURE PROBE "SHORT CIRCUIT" Alarm

This condition will activate alarm and cause high digital temp. readings. Replace probe.

### 1-4. TEMPERATURE PROBES

Two styles of temperature probes, Adult and Pediatric, are available for the Conchapak® System III. Each is easily identified by its own unique adapter. The temperature probe monitors output of the system and provides signals to the low and high temperature alarm circuits.

Either style of probe is connected to the Conchatherm III control module by inserting its connector into the receptacle at the bottom of the module. (See figure 1-6.) Radiant heat will not affect either style of temperature probe, but placing the probe in an environment which is warmer than the temperature for which the Conchatherm heater is set will cause the heater to shut down.



#### A. ADULT TEMPERATURE PROBE

The Adult Temperature Probe, shown in figure 1-7, has an adapter which permits its insertion directly into the ventilator airway to the patient. It is intended primarily for use with a system using the Adult Concha-Column®.

#### B. PEDIATRIC TEMPERATURE PROBE

Systems using the Concha-Pediatric Column will require the Pediatric Temperature Probe and adapter, shown in figure 1-8. The Adult Temperature Probe may be used with the Concha-Pediatric Column, but only when the column is used in a ventilator configuration which requires an adult temperature probe adaptor.



## Section 2

# SET-UP AND OPERATION

### 2-1. MOUNTING THE CONCHATHERM III<sup>®</sup>

The Conchatherm III is completely preassembled and ready for use. It may be mounted on a pole, wall or ventilator. Mounting brackets on three sides of the unit are provided to aid in the most convenient positioning of the control panel and the reservoir bottle bracket.

#### A. POLE MOUNTING

A universal mounting bracket shown in the inset figure 2-1, is packed with the Conchatherm III and may be used for this type of mounting.



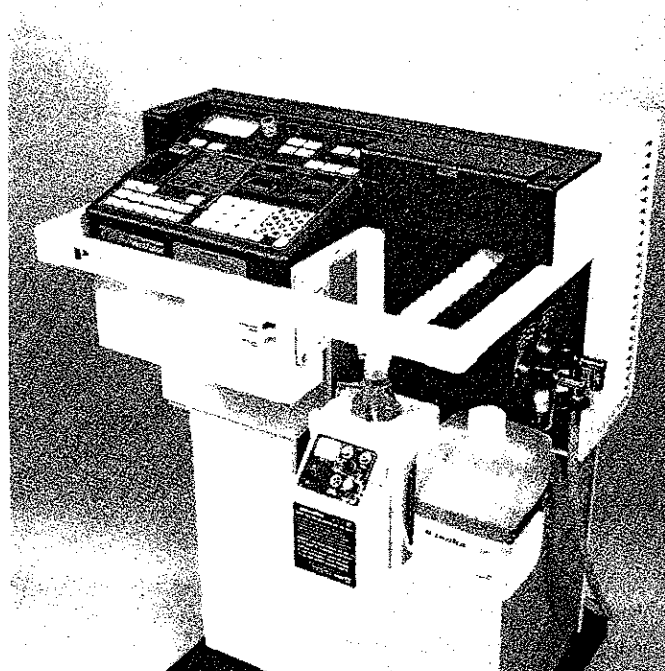
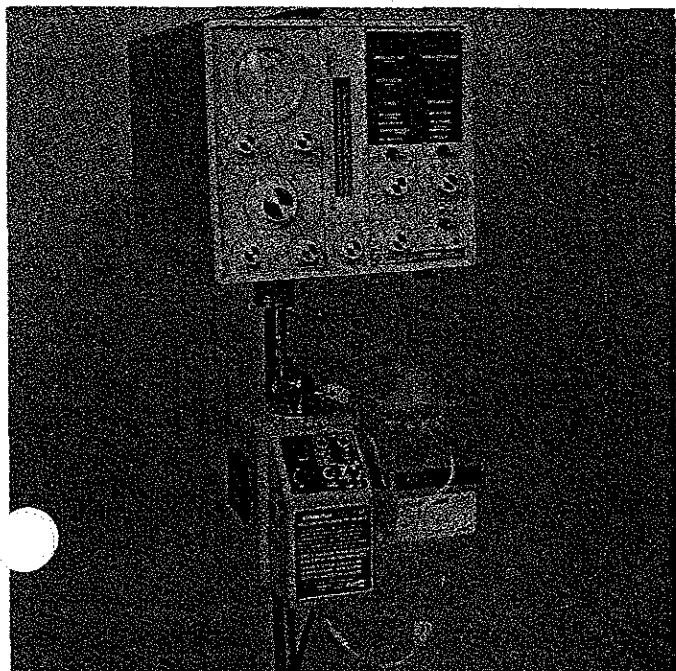
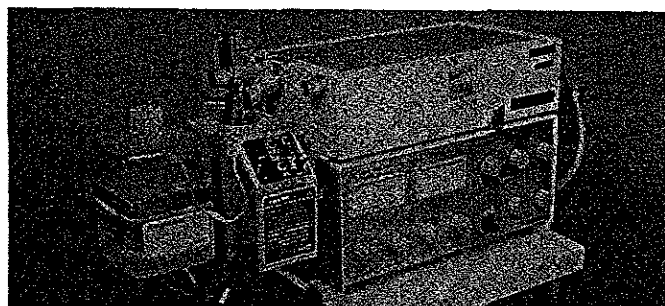
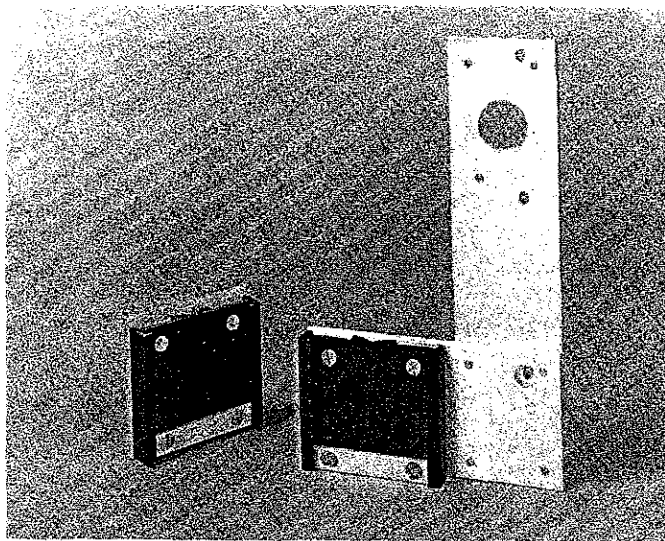
**Figure 2-1**

Pole Mounting of the Conchapak System III.

Remove the four wing nuts from the universal bracket and place the two halves around any I.V. or IPPB pole. Reattach the four wing nuts and tighten the clamp to pole. Then slip the heater into the bracket. With an additional quarter turn to the top two nuts, the Conchatherm III may be locked into the bracket.

#### B. VENTILATOR MOUNTING

The Conchatherm III may be mounted on all Puritan-Bennett, Siemens, Bear<sup>®</sup>\*, and most other ventilators with optional brackets, available from your RCI dealer. A typical bracket is shown in figure 2-2.



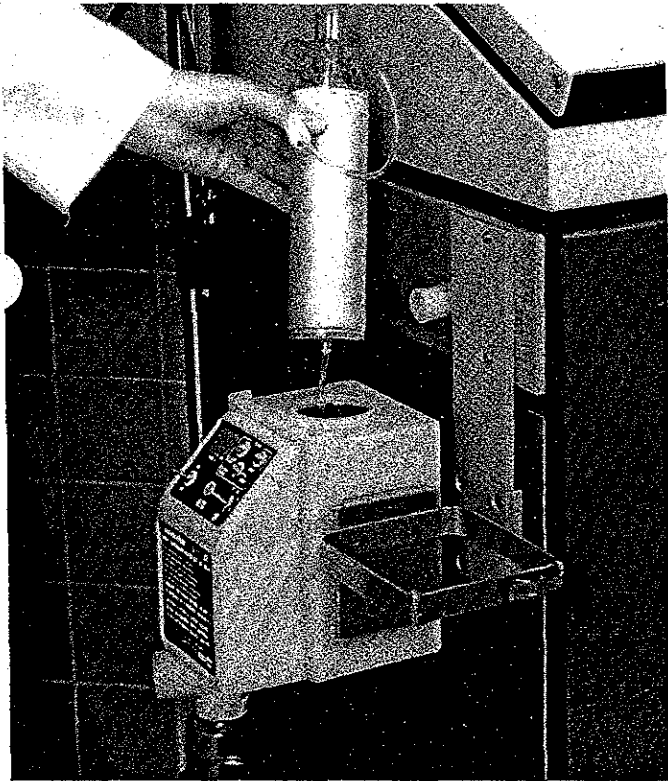
## Section 2

# SET-UP AND OPERATION

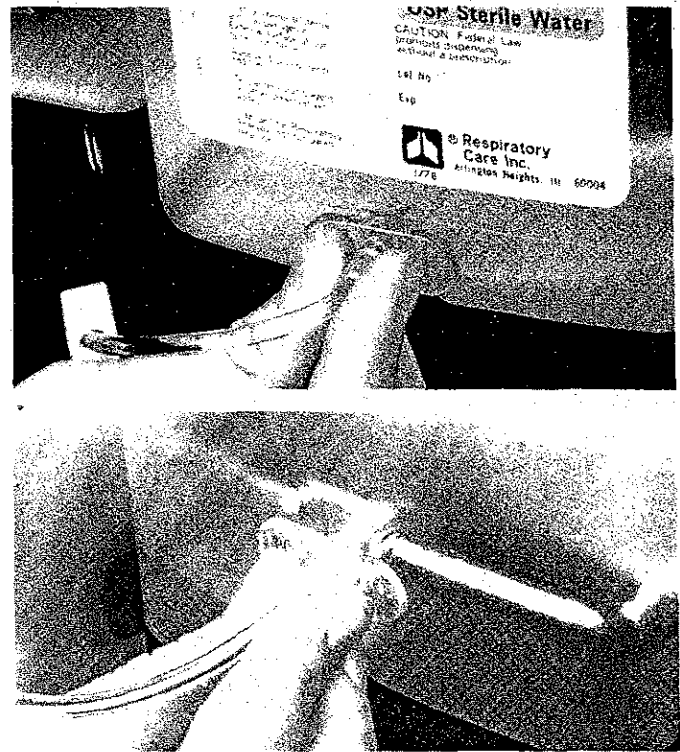
### 2-2. COMPLETING SYSTEM SET-UP

After the Conchatherm® III has been mounted (pole or ventilator), proceed with system set-up as follows:

1. Attach the reservoir mounting bracket to the left or right of the Conchatherm III as shown in figure 2-2.
2. Remove Concha-Column® from its packaging and insert at the top opening of the Conchatherm III, with the bottom puncture pin and tubing passing through unit, as shown in figure 2-2.
3. Remove the Concha® 1500 sterile water reservoir from package. Place it in the reservoir bracket and close the bracket latch. The label on the reservoir bottle should be right-side up.



**Figure 2-2**  
Inserting Concha-Column into Heater Module



**Figure 2-3**  
Inserting Puncture Pins into Reservoir

6. OPEN THE CLAMPS ON THE TUBES FROM THE CONCHA-COLUMN. Water will automatically flow into Concha-Column cylinder.
7. Connect the hose from the gas source or ventilator to the top port of Concha-Column and connect the patient hose to the side port of the column.

#### Note

These connections may be reversed, if desired, except in high flow situation where a lower temperature would result.

When gas is supplied by narrow bore tubing, the #384-00 Adapter (optional) is mounted into the top port.

8. Plug the Adult or Pediatric Temperature probe connector into the receptacle under the base of the Conchatherm III. Connect the temperature probe with the Adult or Pediatric probe adapter into the patient airway wye. An Adult temperature probe, with its adapter, is provided with your Conchatherm III. When your Conchatherm III is used with infants/neonates, the Pediatric temperature probe and adapter (optional) provides additional versatility of your Concha system. Radiant heat will not effect Adult or Pediatric temperature probes.

**CAUTION:** Placing the temperature probe in an environment, such as an Isolette® \*, which is warmer than that from which the heater is set will cause the heater to shut down.

## Section 2

# SET-UP AND OPERATION

### 2-3 SYSTEM OPERATION

Once the system set-up has been completed, as outlined in the preceding paragraph, the system will operate with very little attention, except for replacement of the sterile water reservoir, when required. After the temperature has stabilized, the alarm systems will function automatically to alert the operator when required. (See paragraph 1-3, B for description of the four alarm systems provided.)

#### A. OPERATING PROCEDURES

1. Turn on gas flow or ventilator. Switch Conchatherm® III power switch to the ON position and adjust the TEMP SET control knob to the A position for Adult application (high flow, in excess of 20 lpm), or the P position for Pediatric/Infant application (low flow, less than 20 lpm, but not less than 5 lpm). This will initiate the warm-up cycle. The red TEMP light and the yellow LO TEMP DISABLE light will be on.

##### NOTE

The low temperature audible alarm is deactivated during the warm-up cycle. If the minimum temperature is not reached when the warm-up cycle is over the audible alarm will sound. The operator can silence the alarm and initiate another warm-up cycle by moving the ALARM momentary toggle switch to RESET position. If the minimum temperature range is reached before the warm-up cycle is over, the operator may enable the low temperature alarm immediately by moving the ALARM toggle switch momentarily to LO TEMP ENABLE position.

2. After allowing a reasonable time for temperature stabilization to occur, (approximately 20 minutes Pediatric/Infant; 30 minutes Adult) observe the TEMP°C digital temperature readout. Adjust the TEMP SET control in small increments, as needed, until desired temperature is achieved.

##### NOTE

The time needed for temperature stabilization will vary, depending upon such variables as flowrate, tubing type and length, ventilating volume, etc.

##### CAUTION

The Pediatric Concha Column® is substantially more thermally efficient than the Adult column. Therefore, warm-up time will be reduced and temperature overshoot may occur if the TEMP SET control is initially set too high. STRICTLY observe the P and A indicators upon initial set-up and DO NOT make large changes in the Temp Set control thereafter. Turning

the power switch to OFF for approximately 3 seconds is recommended when making incremental changes in the TEMP SET knob to reset certain control circuits within the unit. Other markings (than the P and A) on the TEMP SET dial are for reference and serial recording of set-point only. MONITOR THE TEMP°C DIGITAL TEMPERATURE DISPLAY WHEN MAKING ADJUSTMENTS. ALLOW SUFFICIENT TIME FOR TEMPERATURE STABILIZATION BETWEEN ADJUSTMENTS.

#### B. REPLACING RESERVOIR DURING PATIENT TREATMENT

The gas flow, continuous or ventilator, need not be interrupted to replenish the sterile water reservoir.

##### CAUTION

The reservoir bottle has a "replacement line" molded into the bottom of the bottle. Water supply at or below this level may cause erratic temperature fluctuations.

##### To change the reservoir:

1. With the lower puncture pin still attached to the reservoir bottle, close the lower tube clamp.
2. Close the clamp on the upper tube from the Concha-Column and remove the upper puncture pin from the reservoir bottle.
3. Open the reservoir bottle holder clamp, lift the bottle out of the holder, and lower the bottle below the Concha-Column. Remove the lower puncture pin from the bottle.
4. Discard the used reservoir bottle.
5. Insert a new Concha® 1500 sterile water reservoir bottle by following steps 3 through 7, paragraph 2-2.
6. OPEN ALL CLAMPS to insure water flow to Concha-Column.

##### NOTE

The Concha-Pediatric Column has one way valves that preclude the need for clamps during reservoir changes.

##### NOTE

Both the adult and pediatric columns are designed for single patient use and should be discarded or destroyed after each patient use. Do not gas sterilize, steam sterilize, or soak in liquid disinfectants.

##### CAUTION

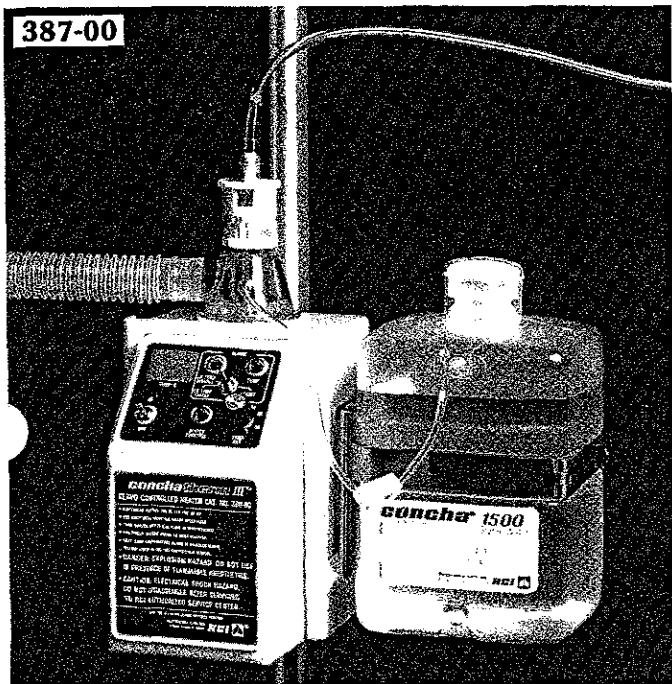
When removing the Concha-Column from the Conchatherm III be careful not to touch the metal portion of the column. It may still be hot and pose a burn hazard.

## Section 2

# SET-UP AND OPERATION

### C. NEBULIZER ADAPTER

For additional versatility, a nebulizer adapter (#387-00), a set of four fixed diluters (#384-05), and an adjustable diluter (#384-06) are available. The nebulizer is used to provide heated aerosol therapy. Insert the siphon tube of the adapter into the top of the column, as shown in figure 2-4. Press the adapter securely onto the column. Attach the small bore tubing and adjust to obtain the desired oxygen concentration.



**Figure 2-4**

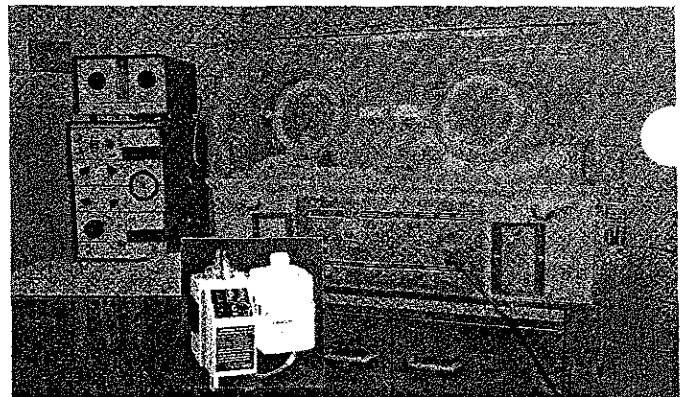
Concha® Nebulizer Adapter in place on Column

### D. OXYHOODS

The Provision of Molecular High Humidity, in conjunction with precise oxygen concentrations in oxyhoods, is easily achieved with the Conchapak® System III by utilizing an oxygen blender. Attach the tubing from the blender to the Concha® System by means of adapter No. 384-00. As usual, temperature and oxygen concentration within the hood should be constantly monitored.

### E. ENVIRONMENTAL CONTROL DEVICES

The Conchapak System III can be easily used with patients inside a very warm environment by placing the probe into the tubing just outside the warming unit. See figure 2-5. Set up in this manner, the sensor will not intermittently turn the heater OFF/ON.



**Figure 2-5**

# TOTAL FLOW CHART

## TOTAL NEBULIZER OUTPUT FLOW RATE (LPM)

AIR = 20.946% O<sub>2</sub>

### O<sub>2</sub> FLOW RATE (LPM)

O <sub>2</sub> %	3.00 LPM	4.00 LPM	5.00 LPM	6.00 LPM	7.00 LPM	8.00 LPM	9.00 LPM	10.00 LPM	11.00 LPM	12.00 LPM	14.00 LPM
100%	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	14.00
98%	3.08	4.10	5.13	6.16	7.18	8.21	9.23	10.26	11.29	12.31	14.36
96%	3.16	4.21	5.27	6.32	7.37	8.43	9.48	10.53	11.59	12.64	14.75
94%	3.25	4.33	5.41	6.49	7.57	8.66	9.74	10.82	11.90	12.99	15.15
92%	3.34	4.45	5.56	6.68	7.79	8.90	10.01	11.13	12.24	13.35	15.58
90%	3.43	4.58	5.72	6.87	8.01	9.16	10.30	11.45	12.59	13.74	16.03
88%	3.54	4.72	5.89	7.07	8.25	9.43	10.61	11.79	12.97	14.15	16.51
86%	3.65	4.86	6.08	7.29	8.51	9.72	10.94	12.15	13.37	14.58	17.01
84%	3.76	5.02	6.27	7.52	8.78	10.03	11.28	12.54	13.79	15.05	17.55
82%	3.88	5.18	6.47	7.77	9.06	10.36	11.65	12.95	14.24	15.54	18.13
80%	4.02	5.35	6.69	8.03	9.37	10.71	12.05	13.39	14.73	16.06	18.74
78%	4.16	5.54	6.93	8.31	9.70	11.08	12.47	13.86	15.24	16.63	19.40
76%	4.31	5.74	7.18	8.62	10.05	11.49	12.92	14.36	15.80	17.23	20.10
74%	4.47	5.96	7.45	8.94	10.43	11.92	13.41	14.90	16.39	17.88	20.86
72%	4.65	6.19	7.74	9.29	10.84	12.39	13.94	15.48	17.03	18.58	21.68
70%	4.83	6.45	8.06	9.67	11.28	12.89	14.50	16.12	17.73	19.34	22.56
68%	5.04	6.72	8.40	10.08	11.76	13.44	15.12	16.80	18.48	20.16	23.52
66%	5.26	7.02	8.77	10.53	12.28	14.04	15.79	17.55	19.30	21.06	24.57
64%	5.51	7.34	9.18	11.02	12.85	14.69	16.53	18.36	20.20	22.03	25.71
62%	5.78	7.70	9.63	11.55	13.48	15.40	17.33	19.26	21.18	23.11	26.96
60%	6.07	8.10	10.12	12.15	14.17	16.19	18.22	20.24	22.27	24.29	28.34
58%	6.40	8.53	10.67	12.80	14.93	17.07	19.20	21.33	23.47	25.60	29.87
56%	6.77	9.02	11.28	13.53	15.79	18.04	20.30	22.55	24.81	27.06	31.57
54%	7.17	9.57	11.96	14.35	16.74	19.13	21.52	23.92	26.31	28.70	33.48
52%	7.64	10.18	12.73	15.27	17.82	20.37	22.91	25.46	28.00	30.55	35.64
50%	8.16	10.85	13.60	16.33	19.05	21.77	24.49	27.21	29.93	32.65	38.09
48%	8.77	11.69	14.61	17.53	20.45	23.38	26.30	29.22	32.14	35.06	40.91
46%	9.47	12.62	15.78	18.93	22.09	25.24	28.40	31.55	34.71	37.86	44.17
44%	10.29	13.72	17.15	20.57	24.00	27.43	30.86	34.29	37.72	41.15	48.01
42%	11.26	15.02	18.77	22.53	26.28	30.04	33.79	37.55	41.30	45.06	52.57
40%	12.45	16.60	20.74	24.89	29.04	33.19	37.10	41.49	45.64	49.79	58.09
39%	13.14	17.52	21.89	26.27	30.65	35.03	39.41	43.79	48.17	52.55	61.30
38%	13.91	18.54	23.18	27.81	32.45	37.08	41.72	46.36	50.99	55.63	64.90
37%	14.77	19.70	24.62	29.55	34.47	39.39	44.32	49.24	54.17	59.09	68.94
36%	15.75	21.01	26.26	31.51	36.76	42.01	47.26	52.51	57.76	63.02	73.52
35%	16.88	22.50	28.13	33.75	39.38	45.00	50.63	56.25	61.88	67.50	78.75
34%	18.17	24.22	30.28	36.34	42.39	48.45	54.50	60.56	66.62	72.67	84.78
33%	19.67	26.23	32.79	39.35	45.91	52.47	59.02	65.58	72.14	78.70	91.82
32%	21.45	28.61	35.76	42.91	50.06	57.21	64.36	71.52	78.67	85.82	100.12
31%	23.59	31.45	39.31	47.18	55.04	62.90	70.77	78.63	86.49	94.36	110.08
30%	26.19	34.93	43.66	52.39	61.12	69.85	78.58	87.31	96.05	104.78	122.24
29%	29.45	39.26	49.08	58.89	68.71	78.52	88.34	98.15	107.97	117.79	137.42
28%	33.62	44.83	56.03	67.24	78.45	89.66	100.86	112.07	123.28	134.48	156.90
27%	39.17	52.23	65.29	78.35	91.41	104.47	117.52	130.58	143.64	156.70	182.81
26%	46.93	62.57	78.21	93.85	109.49	125.13	140.78	156.42	172.06	187.70	218.99
25%	58.50	78.00	97.50	117.00	136.50	156.00	175.50	195.00	214.50	234.00	273.00
24%	77.66	103.54	129.43	155.31	181.20	207.08	232.97	258.85	284.74	310.62	362.40

NOTE: Valuable when using CONCHA® Nebulizer adapter and O<sub>2</sub> dilution systems.

## Section 3

# MAINTENANCE

# CONCHAPAK SYSTEMS

### 3-1. GENERAL MAINTENANCE

The Conchapak System III requires no maintenance, except to keep it wiped clean and to disinfect its outer surfaces.

### 3-2. CLEANING AND DISINFECTING

The outer surface of the Conchatherm III may be disinfected through the use of a non-alcohol based product, such as 3% hydrogen peroxide. Probes should be cleaned by wiping the tip and cable with alcohol or hydrogen peroxide only.

#### CAUTION

- Do not pasteurize
- Do not autoclave
- Do not submerge in any solution
- Do not E.T.O. sterilize

### 3-3. ELECTRICAL MAINTENANCE

Do not disassemble Conchatherm III — please refer to qualified service technicians at:

Heater Service Dept.  
Respiratory Care Inc.  
900 W. University Drive  
Arlington Heights, Illinois 60004  
(312) 259-7400

Catalog Number	Description
380-80	CONCHATHERM® III Heated Molecular Humidifier with Servo Control, Digital Readout and High/Low Temperature Alarms
380-00	CONCHATHERM Humidifier Heater
380-10	CONCHATHERM Pediatric Humidifier Heater
380-74	Adult Probe Adapters
380-82	Adult Thermistor Probe
380-81	Pediatric Probe Adapters
380-83	Pediatric Thermistor Probe
381-50	CONCHA® 1500, Sterile Water 1650 ml.
384-00	CONCHA Tubing Adapter (narrow bore)
384-10	CONCHA Hose Adapter (5/16 inch)
384-05	CONCHA Oxygen Diluters - Fixed (25%, 30%, 35%, 45%)
384-28	CONCHA Oxygen Diluter - Adjustable
384-07	Oxygen Tee Adapter
384-08	CONCHA Adapter Set for Babybird® Ventilator
385-20	CONCHA Pediatric Pak, Sterile Water 1650 ml., Pediatric CONCHA-COLUMN® w/manifold (6 of each)
385-60	CONCHAPAK® 1650 ml., w/CONCHA-COLUMN
386-00	CONCHATHERM Reservoir Bracket for CONCHATHERM 380-00, 380-10
386-10	CONCHATHERM Universal Pole Bracket
386-40	CONCHATHERM Wall Bracket
386-70	CONCHATHERM Universal Ventilator Bracket
386-80	CONCHATHERM III Reservoir Bracket
387-28	CONCHA NEBULIZER Adapter
386-75	CONCHA Siemens Bracket

\*Babybird is a 3M Trademark

### FUNCTIONAL TEST PROCEDURE

1. Set-up heater and full reservoir for normal operation. Insert a standard adult CONCHA-COLUMN into heater. Column must slide freely into heater tube. Connect column tubing to reservoir.
2. Attach continuous non-ventilated 68 to 78°F. dry air at 12 LPM to the top of column.
3. Set the temperature control knob at the "hash mark" just before the 7 on the dial.
4. Install a 72 inch KRATON®\* hose on the output port of the column. Using a Concha temperature probe adapter, connect the CONCHATHERM III temperature probe to the end of the hose.
5. Attach a digital thermometer with accuracy of  $\pm 1^\circ\text{F}$ . or better, at the end of the hose.
6. With the above settings, apply power to the heater and allow 35 - 45 minutes for temperature to stabilize.

Your test results should be as follows:

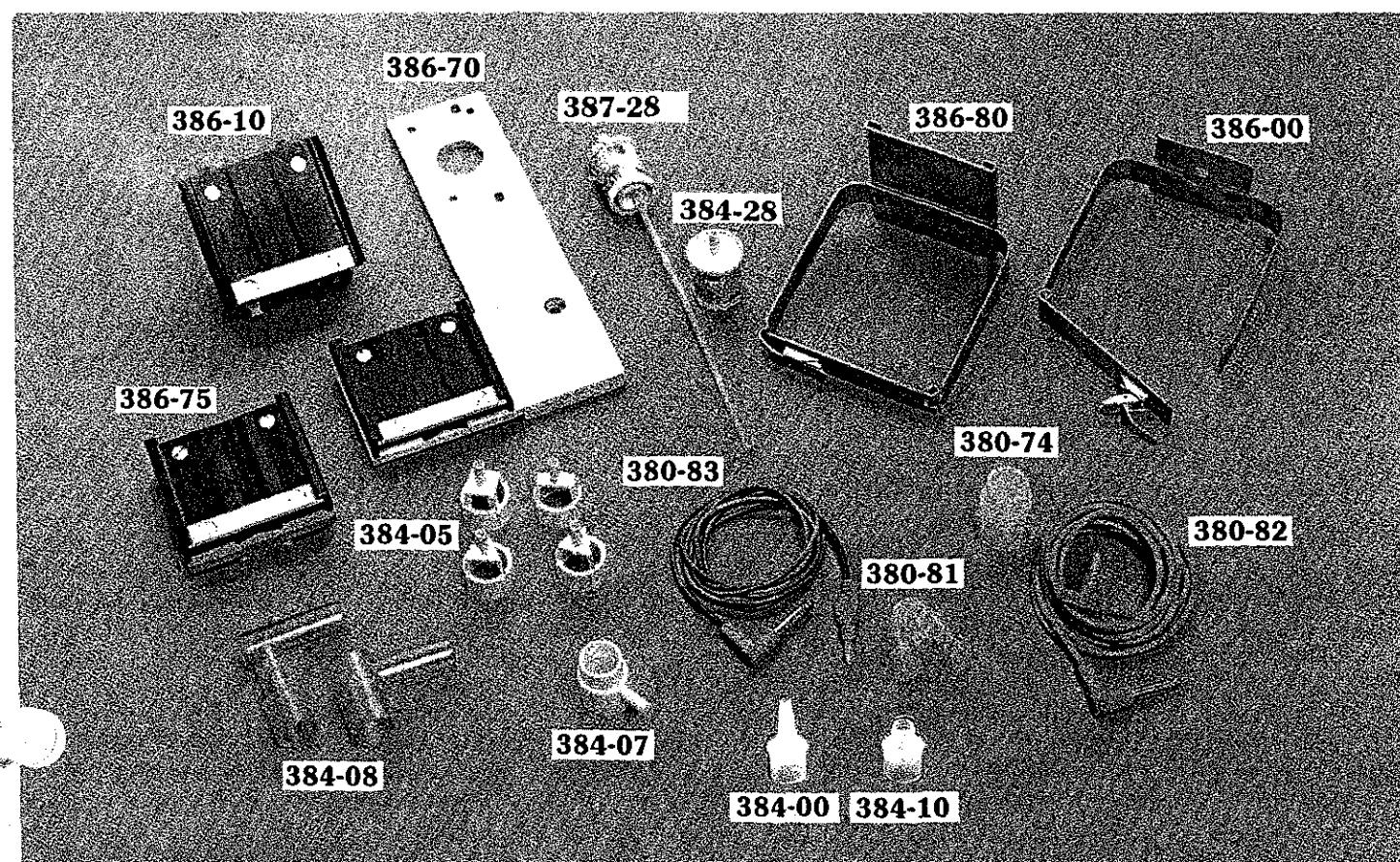
ROOM TEMP	CONCHA III DISPLAY	DIGITAL THERMOMETER READING
68°F - 72°F	33-36°C	90.5 - 95.9°F or 32.5 - 35.5°C
73°F - 76°F	33-36°C	91.4 - 96.8°F or 33.0 - 36.0°C
77°F - 83°F	34-37°C	92.3 - 98.6°F or 33.5 - 37.0°C

#### NOTE:

Use a fresh standard adult CONCHA-COLUMN for testing. The Low Compliance Pediatric/Adult column more thermally efficient and will provide approximately 3-4°F (approx. 2°C) higher temperatures than the standard adult column at equal settings.

\*Trademark of Shell Chemical Co.





## HOW TO GET EXPEDITED SERVICE FOR CONCHATHERM III HEATER

If the CONCHATHERM III should ever require factory maintenance, the following steps will assure expedited service:

1. Call or write the Customer Service Department at RCI (312) 259-7400 and ask for a Return Goods Authorization (RGA) number.
2. For fastest possible service, you may authorize the replacement of your heater with a like-new heater under a full new heater warranty. This will permit RCI to ship you a replacement heater within 7 days after receipt of your heater.

If you elect to have your serial numbered heater serviced and returned, turn-a-round time is longer than with the replacement program.

3. Please provide the following information when returning a CONCHATHERM III Heater for service:

- A. Your Return Goods Authorization number (obtained from RCI Customer Service Department)
- B. Permission for RCI to replace your heater with another like-new fully warranted heater OR indicate that you want your serial numbered heater serviced and returned.
- C. The nature of the malfunction (please be as specific as possible)

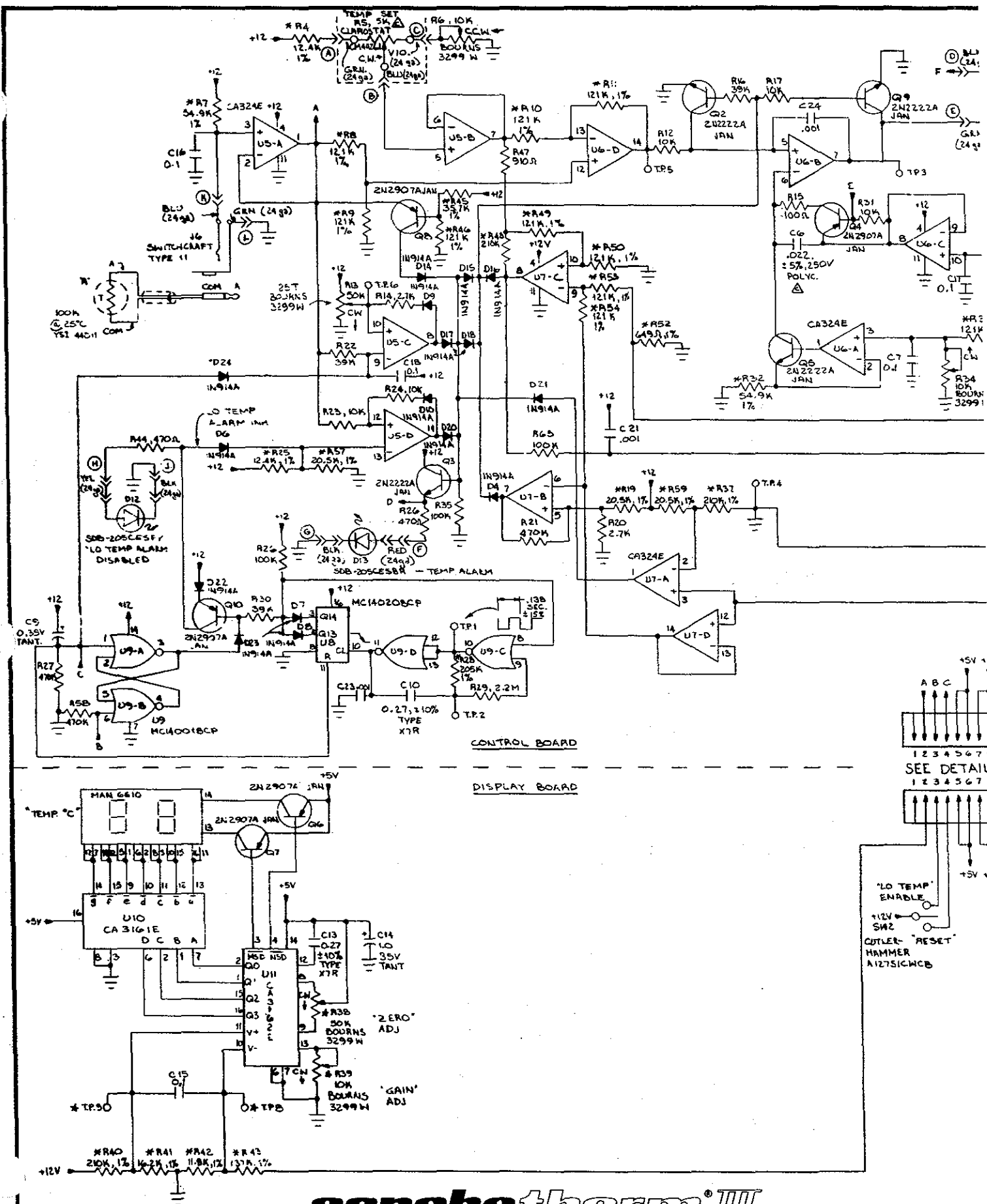
MAXIMUM CHARGE FOR REPAIR IS \$100.00  
AFTER EXPIRATION OF 1 YEAR WARRANTY.  
NEW WARRANTY FOLLOWS EACH REPAIR.



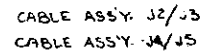
RESPIRATORY CARE INC.  
900 W. University Drive  
Arlington Heights, IL 60004 USA  
Phone 312-259-7400

Form No. LL-01050287






POWER SUPPLY BOARD



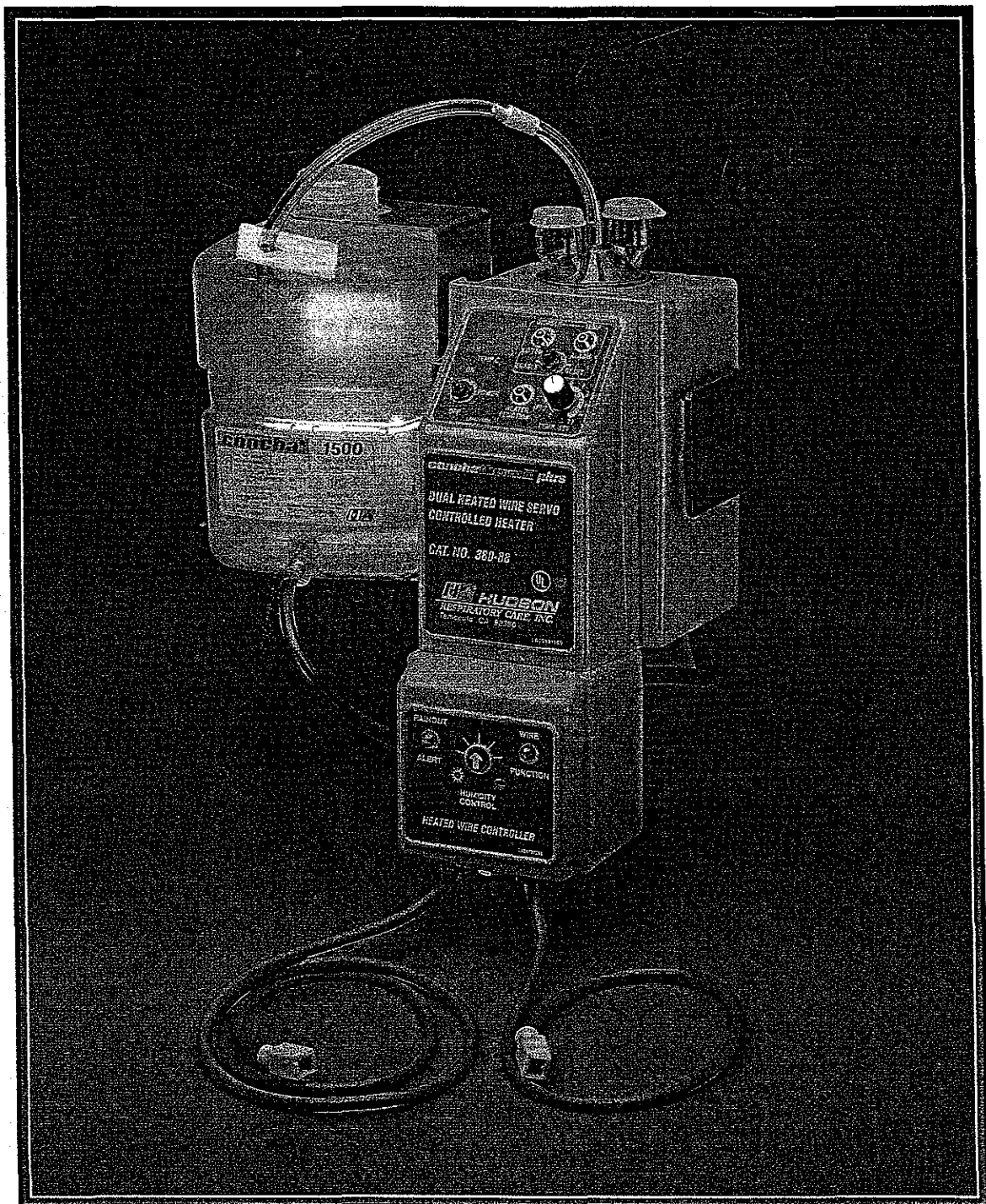
1. ALL VOLTAGES ARE DC REFERENCED TO GROUND U.O.S.
2. ALL CAPACITANCES ARE  $\mu$ F U.O.S.
3. ALL CAPACITORS ARE  $\pm 50$ ,  $\pm 20\%$  TOL., 50 VOLT MIN., MONOLITHIC CERAMIC TYPE U.O.S.
4. (\*) DENOTES  $\pm 1\%$  TOL., METAL FILM TYPE RESISTORS. UNLESS OTHERWISE STATED ALL OTHER RESISTORS ARE RCA,  $\pm 5\%$  TOL.,  $1/4$  WATT, CARBON COMP TYPES.
5. ENCIRCLED LETTER DESIGNATIONS REPRESENT WIRE ENTRY POINTS ON PC BOARD.
6. (\*) DENOTES COMPONENTS WHICH ARE TO BE MOUNTED ON SOLDER SIDE OF CIRCUIT BOARD.
7. LAST DESIGNATIONS USED: U12, Q11, D31, C25, R69, P5, J6, TP9, F2, SW2, T1, L1.

 <b>Respiratory Care Inc.</b>		
SCALE <i>1/2"</i>	APPROVED BY <i>Y</i>	DATE <i>7/27/82</i>
DATE: <i>2/2/82</i>		DESIGNED
CONCATENATED + M II. SCHEMATIC		
RESPIRATORY CARE, INC.		DRAWING NUMBER <b>ES-0002</b>

**HUDSON RCI®**

# **CONCHATHERM III® PLUS**

Catalog Nos. 380-88 & 380-90



## OPERATING MANUAL

# INTRODUCTION

## Intended Use

The CONCHATHERM® III Plus is a complete system designed to heat and humidify respiratory gases delivered to the patient. Catalog Nos. 380-88 and 380-90 identify the system as the Adult version (21 volts output) or Pediatric version (16 volts output), respectively.

When using the CONCHATHERM III Plus in conjunction with a compatible heated-wire circuit, the system's Heated Wire Controller regulates the heat supplied by the wire in the breathing circuit.

The CONCHATHERM III Plus may also be operated with conventional circuits (without heated wire). When a conventional circuit and a single probe are used, the heated-wire controller is automatically disabled and the heater performs identically to the CONCHATHERM III.

This system can be used with ventilators, continuous flow and oxygen diluters, blenders, adjustable nebulizer adaptors for aerosol therapy (using a conventional circuit), or nonflammable anesthesia gases to help maintain patient body temperature.

The CONCHATHERM III Plus is designed for use with Hudson RCI circuits and temperature probes. The conditions described throughout this manual assume that Hudson RCI products (or compatible neonatal circuits) are being used with this humidification device and that the setup is performed correctly.

## Features

- Can be used with conventional or heated-wire circuits
- Rainout alert illuminates when the desired temperature gradient is not being achieved
- Alarms and safety features help prevent inappropriate temperature delivery
- Multiple temperature probes for infants or adults
- Self-contained water system
- Multiple mounting capabilities
- Audio-visual alarms
- Preset high/low temperature alarms
- Servo-controlled heater continuously monitors and regulates temperature of heater output
- Adjustable temperature setting for use with adult or pediatric ventilatory applications
- Digital readout within  $\pm 2^{\circ}\text{C}$  accuracy

PRINCIPLES OF OPERATION

SPECIFICATIONS

CONTROLS AND INDICATORS

DIRECTIONS FOR USE

TROUBLESHOOTING AND MAINTENANCE

PARTS AND ACCESSORIES

## PRINCIPLES OF OPERATION

The CONCHATHERM III Plus System combines three major components: Heated humidifier with heated wires and temperature probe; CONCHA-COLUMN® and CONCHA® 1500 sterile water; Hudson RCI heated-wire circuit. The servo-controlled heater continuously monitors the patient airway temperature and regulates the heat supplied by the heater to the column.

The activity between the system's heater module and the CONCHA-COLUMN is critical to the humidification process. Sterile water flowing from the reservoir bottle to the CONCHA-COLUMN wets the absorbent wick lining the inside of the column. The heating element

that surrounds the column conducts heat through the column's metal wall, heats the wick and vaporizes the sterile water. Gas flowing into the column picks up the moisture in molecular form. The breathing circuit, connected to the top of the column, delivers the heated, humidified gas to the patient. This humidification process offers virtually no resistance to gas flow.

The column required for the CONCHATHERM III Plus is available in standard and low-compliance configurations. Labels on the neck of the columns are color-coded in black or red for easy identification. Both operate on a reliable, gravity-feed system for uninterrupted water flow.

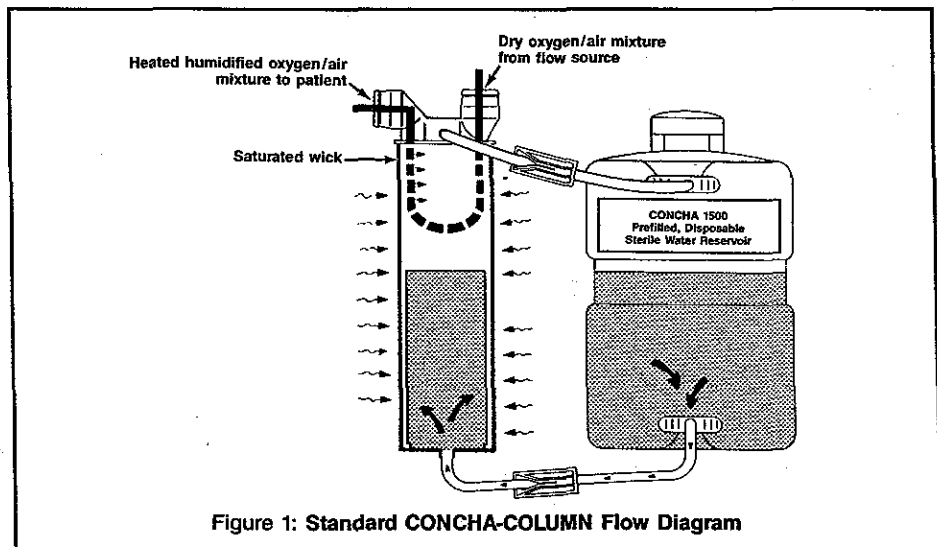
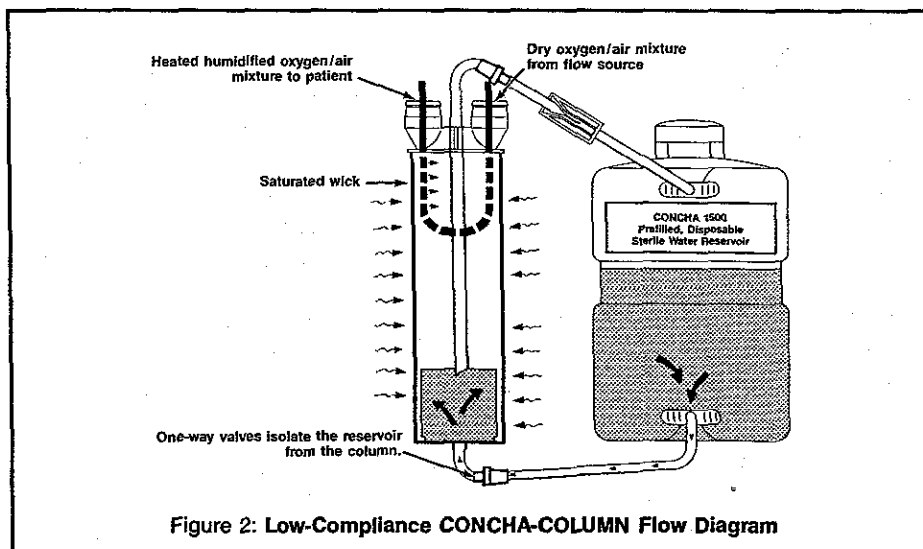


Figure 1: Standard CONCHA-COLUMN Flow Diagram

The standard column is designed for use with ventilatory parameters most commonly used with adults. The water level in the column and in the reservoir will remain the same. An upper reservoir vent tube provides pressure equalization.

►► NOTE: As the water level in the reservoir and the CONCHA-COLUMN drops, the compressible volume of the system increases and the system compliance changes. For applications requiring a more constant compressible volume and compliance, a low-compliance column should be used (Cat. No. 385-20 or 385-30).



The low-compliance column contains a beveled sensing tube to control the water level in the column and the amount of air allowed into the reservoir head space. The sensing tube will cut off the reservoir's air supply if the column water level is above the bevel of the tube. A one-way valve in the upper reservoir tube allows flow into the reservoir and restricts flow back out. This prevents the reservoir pressure from being vented back into the column during the expiratory phase of a ventilator cycle. A one-way valve in the lower reservoir tube prevents the flow of water from the column back into the reservoir during the inspiratory phase of a ventilator cycle.

The system's compliance equals the column's compliance plus the amount of fluid transferred to the bottle during each inspiratory phase. The column's compliance alone equals approximately 0.25 ml/cm H<sub>2</sub>O. The amount of fluid transferred to the bottle varies slightly depending on the setup.

The fluid transferred to the bottle through the upper tube can be in the form of air or water. Some fluid always transfers during each cycle, depending on ventilator settings.

Several factors increase the amount of fluid transfer: high peak pressure, lower breath rates, reduced water volume in bottle, I/E ratios approaching 1:1.4, and square pressure waveforms.

The typical compressible volume equals 248 ± 12 ml. The water level in the column drops as the gas is humidified. As the water drops below the beveled refill point (± 5), water will automatically feed from the reservoir bottle.



**WARNING: A change in pressure will cause the water in the column to rise temporarily and affect compressible volume.**

When compared to the standard column, the low-compliance column will produce a higher output temperature (approx. 2°C), heat up and cool down faster and produce a more constant temperature.

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## **Temperature Probes and Adaptors**

Temperature probes monitor the system's output and signal low and high temperature alarms. The CONCHATHERM III Plus is designed for use with a heated-wire breathing circuit and a dual-cable temperature probe for monitoring at the proximal airway and at the humidifier. The system will regulate the temperature gradient between these two temperature points.

If a conventional breathing circuit and a single probe are used, the system will perform as a CONCHATHERM III (the Heated-Wire Controller is non-operative). For applications requiring a conventional circuit, use only a single temperature probe. (Use of dual temperature probes with a conventional circuit will activate the heated-wire controller and the rainout alert light will illuminate.)



## SPECIFICATIONS

The CONCHATHERM III Plus comes in an adult model, 380-88, and a pediatric model, 380-90. They operate identically and the specifications described below may apply to either model unless otherwise stated.

### Power Output:

380-88 Adult version	21 volts
380-90 Pediatric version	16 volts

Operating Voltage and Power: 115 VAC  $\pm$  10 at 60 Hz, 230 watts for 380-88 and 250 watts for 380-90

**! WARNING: This unit requires 115 VAC, 60 Hz sine wave output. When used in ambulances, helicopters, and other mobile life support vehicles requiring an inverter, do not use square wave or pulse width modulated sine wave output. Overheating could result.**

Leakage Current:	Less than 100 microamps, 15-25 $\mu$ A typ
Dielectric Withstand:	1,250 volts minimum for 1 minute
Digital Display:	2-digit LED, 0°C to 70°C, accuracy within $\pm$ 2°C
High Temp Alarm Limit:	40.1°C $\pm$ 0.5°C typical (range of 39.6°C to 40.6°C)
Low Temp Alarm Limit:	27°C $\pm$ 1°C typical after warmup period of 25 minutes (range of 26°C to 28°C)
Warmup Time:	Approximately 25 minutes (preset)
Physical Characteristics:	
Size	10½" height (allow 13" when circuit is installed); 4½" width
Weight:	8 pounds (approximate)

### Hudson RCI Heated-Wire Breathing Circuits: *(order separately)*

380-88 Adult version:	Designed for use with the CONCHATHERM III Plus. Powers the inspiratory limb and, if applicable, the expiratory limb.
380-90 Pediatric version:	Designed for use with Hudson RCI conventional and heated-wire neonatal circuits. <b>► CAUTION: If using a compatible neonatal heated-wire circuit, be sure that the circuit has the proper powering capabilities (16 V).</b>

### CONCHA-COLUMN *(order separately)*

Standard: (Cat. Nos. 385-60, 385-70)	Water capacity upon setup with full bottle: 193 cc $\pm$ 10 cc*
Low-Compliance: (Cat. Nos. 385-20, 385-30)	Water capacity upon setup with full bottle: 52 cc $\pm$ 10 cc

\*Amount of water in column will decrease as water is used.

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